CLAIMS

What is claimed is:

1. A method for calibrating a machine tool, the machine tool producing an output, the method comprising:

identifying a plurality of critical components (CC);

identifying each critical device (CD) that is employed to affect a position of an associated critical component (CC);

identifying a plurality of possible positions (PP_{CD}) for each critical device (CD);

identifying a plurality of possible combinations (PC), each possible combination (PC) including one of the possible positions (PP_{CD}) for each of the critical devices (CD); and

evaluating each of the possible combinations (PC) to identify which of said possible combinations (PC_A) adversely effect the output of the machine tool.

2. The method of Claim 1, wherein each of the possible combinations (PC) is identified in a Yates algorithm.

3. The method of Claim 1, wherein the evaluating step includes modeling at least one of the possible combinations (PC) to determine an effect of the possible combination (PC) on the output of the machine tool.

4. The method of Claim 3, wherein computerized three-dimensional solids modeling is employed in the modeling step.

5. The method of Claim 1, further comprising:

identifying a plurality of strategic positions (SP_{CD}) from said possible combinations (PC_A) that adversely effect the output of the machine tool, each strategic position (SP_{CD}) being associated with a corresponding critical device (CCD);

determining an actual position of each critical component (CC);

determining whether any of the corresponding critical devices (CCD) have been positioned in a strategic position (SP_{CD}) that adversely effects the output of the machine tool and if so, making an adjustment to at least one of the critical devices (CD) so that no critical device (CD) is positioned in a strategic position (SP_{CD}) that adversely effects the output of the machine tool.

6. The method of Claim 5, wherein the at least one of the critical devices (CD) is adjusted to align at least one of the critical components (CC) to a predetermined datum.

7. The method of Claim 6, wherein the predetermined datum is derived from a selected one of the plurality of strategic components (SC).

8. The method of Claim 7, wherein the predetermined datum is a longitudinal axis of the selected one of the plurality of critical components (CC).

9. The method of Claim 5, wherein the critical devices (CD) are jack screws and the method further comprises determining an amount and direction by which each jack screw is to be rotated.

10. The method of Claim 1, wherein at least a portion of the possible positions (PP_{CD}) are relative positions.

11. A method for calibrating an extrusion press, the extrusion press having a main ram, a moving crosshead and a container, the main ram including a front platen and a rear platen, the moving crosshead including a stem, the method comprising aligning an axis of the container directly to an axis of the stem.

12. The method of Claim 11, further comprising:

establishing an axis of the stem;

establishing an axis of the container;

adjusting the container such that the axis of the container is coincident to the axis of the stem.

13. The method of Claim 12, wherein a laser transmitter is employed to establish the axis of the stem.

14. The method of Claim 13, wherein a chuck is employed to removably couple the laser transmitter to the stem.

15. The method of Claim 13, wherein a chuck and a laser receiver are employed to establish the axis of the container.

16. The method of Claim 15, wherein the step of establishing the axis of the container comprises:

determining a location of a first point on the axis of the container; and

determining a location of a second point on the axis of the container.

17. The method of Claim 12, wherein a plurality of jack screws are employed to selectively position the container and wherein the step of adjusting the container includes determining an amount and direction in which each of the jack screws is to be rotated.

18. The method of Claim 11, further comprising aligning the moving crosshead horizontally and vertically to an axis defined by the main ram.

19. The method of Claim 18, wherein the step of aligning the moving crosshead horizontally comprises:

mounting a laser transmitter to one of the front and rear platens;

moving a laser receiver to the other one of the front and rear platens;

generating a laser beam with the laser transmitter;

receiving the laser beam with the laser receiver to establish an offset axis, the offset axis being horizontally offset from the axis of the main ram by a predetermined distance;

mounting the laser receiver to the moving crosshead;

receiving the laser beam with the laser receiver to determine an amount by which an axis of the moving crosshead is horizontally offset from the offset axis; and

calculating an amount by which the axis of the moving crosshead is horizontally offset from the axis of the main ram.

20. The method of Claim 18, wherein the step of aligning the moving crosshead vertically comprises:

mounting a laser transmitter on a first lateral side of the extrusion press, the laser transmitter generating a laser beam that is contained in a first horizontal plane;

mounting a laser receiver to the rear platen on the first lateral side;

transmitting the laser beam in the first horizontal plane to the laser receiver to determine a first elevation of the rear platen;

mounting the laser receiver to the front platen on the first lateral side;

transmitting the laser beam in the first horizontal plane to the laser receiver to determine a first elevation of the front platen;

mounting the laser receiver to the moving crosshead on the first lateral side;

transmitting the laser beam in the first horizontal plane to the laser receiver to determine a first elevation of the moving crosshead;

mounting the laser receiver to the container;

transmitting the laser beam in the first horizontal plane to the laser receiver to determine an elevation of the container;

mounting a laser transmitter on a second lateral side of the extrusion press such that the laser transmitter generates the laser beam in a second horizontal plane;

transmitting the laser beam in the second horizontal plane to the laser receiver that is mounted on the container to determine a lateral elevation offset;

mounting the laser receiver to the rear platen on the second lateral side;

transmitting the laser beam in the second horizontal plane to the laser receiver to determine a second elevation of the rear platen;

mounting the laser receiver to the front platen on the second lateral side;

transmitting the laser beam in the second horizontal plane to the laser receiver to determine a second elevation of the front platen;

mounting the laser receiver to the moving crosshead on the second lateral side;

transmitting the laser beam in the second horizontal plane to the laser receiver to determine a second elevation of the moving crosshead;

employing the first and second elevations of the rear platen, the first and second elevations of the front platen and the lateral elevation offset to determine a position of the axis of the main ram in a generally vertical plane; and

employing the first and second elevations of the moving crosshead and the lateral elevation offset to determine a position of the axis of the moving crosshead in the generally vertical plane.

21. The method of Claim 20, further comprising adjusting the moving crosshead such that the axis of the moving crosshead and the axis of the main ram are coincident in the generally vertical plane.

22. The method of Claim 21, wherein a plurality of jack screws are employed to selectively position the moving crosshead and wherein the step of adjusting the moving crosshead includes determining an amount and direction in which each of the jack screws is to be rotated.